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ABSTRACT

Both the Apple and TRS-80 microcomputer units are being used in the department of physical education at George Mason University (Virginia). As a first step, a computer program was developed and used in conjunction with an aerobic and personal conditioning class. (The capabilities of this specific program are discussed, and the ways in which it was useful in individualizing programs and activities are pointed out.) In another program used for grading, a number of complex processes were found to assist in more accurate and equitable assessment and grading of students. In a track and field class, a program was designed so that race and practice paces could be obtained based on various individual factors. Plans are being made to extend and expand uses of the TRS-80 to enhance programs, expand opportunities, and improve computer experiences for students. Additional computer and data processing possibilities are being contemplated and explored in the areas of coaching, intramural programs, administration, scheduling, individualizing instruction, and developing knowledge, understanding, and appreciation of general physical education concepts, specific sport rules and strategies, and skill development. (JD)

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# Practical Micro-Computer Uses in Physical Education at George Mason University

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Don't look now but we are in the midst of a technological revolution! At the very heart of this revolution is the computer.

Actually opportunities to make scheduling easier and more efficient, improve programs and instruction, aid in reporting to parents, facilitate administration, and explore areas in ways that had been impossible or impractical before have been possible for a number of years because of computerization. Local education agencies, and to some extent individual schools, have been using computers and data processing for specific purposes for at least twenty years. For the most part computerization has been used in conjunction with entire school systems or individual school programs. In too few instances have physical educators and coaches throughout initiated computer uses and data processing approaches unique to their needs. Little has been done and reported about practical ways in which microcomputers can be used for various purposes by physical educators and coaches.

Examination of the literature reveals few articles focusing on practical computer uses in physical education and sports. Reviews of programs at national, district, and state conventions show little

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attention to this immensely important and growing topic. Generally attention given to computerization has focused on and been devoted to research and topics of interest to researchers. Popular magazines such as Sports Illustrated have devoted space to the marriage among biomechanics, cinematography, and computerization as an adjunct in training highest level elite athletes. This approach continues to receive increasing attention in programs and activities of the U.S. Olympic Committee at its Training center in Colorado Springs. However, little attention has been given computerization in terms of practical implications for and applications to ongoing programs and activities of interest to physical education teachers whether at elementary, secondary, or college/university levels, and to coaches at these same levels.

Increasing numbers of schools possess some type of microcomputer--Apple, TRS-80, Atari. With microcomputers in so many school buildings it is incumbent on physical educators and coaches to recognize how this technology can enhance their programs. Even without access to printers, possibilities and potential are endless.

At George Mason University (Fairfax, Virginia) both Apple and TRS-80 units are being used in the Department of Physical Education. Programs developed and distributed by Project R.E.A.C.T.--Recreational Education Alternative Curriculum Techniques[1]--have been purchased and are used with physical education major classes in a number of ways--

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[1]Project R.E.A.C.T., 1313 S.E. 5th Street, Minneapolis, Minnesota 55414; Jo A. Boettcher, Project Director

- Acquaint students with computerization and data processing.
- Explore ways in which computerization and data processing can be used to enhance curriculum development and implementation.
- See and use computers for testing and assessing progress in various ways.
- Test knowledge about given physical education and sport activities.
- Delve into sport rules and officiating.

Since this software is compatible with Apple hardware, a unit is brought to the Department of Physical Education or students go to the computer lab for these experiences. As a result these specific programs and the Apple computer in general have not been used to extents they could and should.

A major reason for some deemphasis in use of Apple programs and hardware has been a TRS-80 III currently housed in the Department of Physical Education. This two disk drive unit has capabilities of interfacing with audiocassette, printer, word processor, and additional disk drive units to increase overall storage and operational capacities. With necessary cabling the TRS-80 can be modified to serve as a terminal in the university's major computer systems as well as an independent and autonomous unit. Much use and great benefits have been attained with this basic two disk unit which has capabilities of functioning as any other TRS-80 BASIC computer, or as a Disk Operating System (DOS). While capacity is not as great as main frames or large disk operating systems, the TRS-80 can perform virtually any and all operations done by large systems; in addition, TRS-80 graphic capabilities are great.

During the spring 1982 semester, the first in which the TRS-80 unit was available to the Department, a great deal of experimentation resulted in a number of practical computer programs. Early in the semester a computer program was developed and used in conjunction with an aerobic and personal conditioning class. This specific program had a number of capabilities--

- Compute mileage required to attain each of Cooper's aerobic classification indexes in the 12-minute and 1.5 mile runs based on age and sex.
- Compute aerobic classification index, average time per mile, and analyses based on times for each lap (148, 220, or 440 yards or their metric equivalents), quarter mile/400 meters, half mile/800 meters, one mile/1600 meters for 12-minute and 1.5 mile runs.
- Compute amount and percentage of improvement from pre to post administrations of 12-minute and 1.5 mile runs.

This information was extremely helpful and valuable to students in assessing personal status in terms of aerobic classification indexes and how well they paced themselves in their runs. Well paced efforts, as well as poorly paced runs, become obvious and aid students reach performance levels in these aerobic efforts that are much more indicative of true aerobic capacity and function.

This information is also used for individualizing programs and activities. Targets in terms of practice distances and times and aerobic points for improving aerobic classification indexes along with appropriate paces to attain these specific goals are gained from these

computer based analyses. Each student receives times and distances for each class period based on aerobic points for long slow distance workouts as well as for short and fast interval workouts. Students not only were extremely receptive to these data but improved an average of over 300 yards per student in the 12-minute run (in excess of thirteen percent) over twelve weeks in which they took part in class activities three times per week.

Several computer programs have been developed to translate class performances into grades. Faculty members taking advantage of these opportunities have individual personal disks containing necessary system software and computer programs designed for specific classes. While scores and data from and about students have not been placed into permanent files and stored, these capabilities are available should any faculty member desire to keep such information. A number of approaches have been used in these grading programs.

A master program was developed for <u>all</u> classes taught during the semester by one professor. Specific items or categories of grading criteria were programmed in ways that could be used across classes as data were entered and tabulations made. Different weightings or percentages for specific items or categories of grading criteria created no difficulties or problems in that formulas for tabulating points for final grades were included on a class by class basis. This process enabled the faculty member to do all grading at one time and permitted more thorough analyses and inclusions in much more rapid ways which saved a great deal of time.

Other faculty members had individual programs developed for each

class since each teaches different combinations of courses from year to year. Additional programs are used to average grades for sections or modules of courses; this was especially useful in a course team taught by four faculty members. One of these programs has a built in conversion routine that accepts letter grades including +'s and -'s, and translates them into numerical equivalents. After accepting all of these data computations are made and tabulations presented in terms of numerical average and letter grade equivalent for each student. Other routines contained in this program provide capabilities of changing numerical equivalents for letter grades to that desired by the specific faculty member. The program can also handle a variety of numerical grades for averaging based on different weightings, make necessary computations, and then translate results into grades based on predetermined ranges established by the faculty member. Other routines in these programs sort student scores, rank and then display them from high to low.

In another program used for grading, a number of complex processes make possible more accurate and equatible assessment and grading of students. In the aerobic and personal conditioning class, students starting in higher (better) aerobic classifications do not have to show as much improvement in the 12-minute run as those in lower aerobic classifications to gain maximum improvement points. Students in the excellent category only have to improve four percent to gain maximum points, those in the good category eight percent, those in lower (fair, poor, very poor) categories twelve percent. Different numbers of points are given for higher aerobic classification indexes attained at the end of the semester. Relationship of target aerobic

points to points actually attained over the semester are analyzed and points apportioned appropriately by the computer; totals are based on figures from each of the twelve weeks of the program. Participation points are assigned after analyzing absences in relation to total number of class periods; percentages are tabulated within the computer program. Outside participation is based on percentage of target points attained; twenty-five percent of aerobic points must be obtained out of class--again, the computer does this analysis. Specific assignments and examinations are incorporated into the overall program which does all necessary conversions, assigns points, completes final tabulations, and presents all information including total points for each student. Obviously the computer makes it possible to consider factors in ways that could not and would not be considered without memory, analysis capabilities, and speed of the computer.

Additional programs have been developed for physical education major classes. In a track and field class, a program was designed so that race and practice paces could be obtained based on various individual factors--

- Target time for specific distance in either yards or meters.
- Type of time split desired between first and second halves of the race distance--i.e., even, 2 or 4 second differentials.
- Type of workout desired--i.e., pace, rhythm, increasing rhythm, decreasing rhythm.
- Distances for which data are desired--100 yards/110 meters to one mile/1600 meters.

The routine previously discussed in relation to the aerobic and

personal conditioning class is most appropriate for use in analyzing ways runners pace themselves at whatever distances run, whether in meets or during practice sessions. Options are included so that these analyses can be generated for tracks of different lengths as often found during the indoor season. In addition, analyses can be obtained for different combinations on any standard length track--i.e., every 110 yards/100 meters or 220 yards/200 meters for a 440 yard or 400 meter track.

The Radio Shack Advanced Statistical software package was obtained to further capabilities and uses of the TRS-80 by the faculty. Included in this package are individual programs for each of the following statistical operations--

- Descriptive statistics--range, mean, standard deviation, variance
- Histogram and frequency distribution
- Correlation and ~~single~~ linear regression
- Multiple linear regression
- T-test for matched pairs
- Analysis of variance
- Citi Square

As faculty members find need to use any of these statistical programs, they are placed on individual disks for personal use. In this way necessary programs, including appropriate system software, and data for analyses are maintained in one neat package. Data being analyzed can be kept on the same disk with statistical programs or on an entirely different one. Additional opportunities are being planned

so that students doing projects and those in courses such as tests and measurements can have access to these statistical programs.

The scratch that scratched the surface has not been scratched! Plans are being made to extend and expand uses of the TRS-80 to enhance programs, expand opportunities, and improve computer experiences for students. Additional programs related to curriculum in a number of classes are being developed so that students can have more first hand and hands on experiences with computers. A special course in computer uses for physical education and sports is being explored and may be experimented with during the next academic year. Among additional computer and data processing possibilities being contemplated and explored are--

- Coaching--keep statistics on your own players; keep scouting information on opponents, both teams and individuals; store information about offensive and defensive systems as well as specific plays; find offensive and defensive trends of both your own and other teams; monitor equipment records and inventories; develop and compare financial records of all types.
- Intramural programs--keep individual and team records and award information; assist in scheduling and developing tournaments of various types; use in seeding, establishing heats, sections, and flights, and maintaining won/lost records; assign and keep records of practice time for teams and individuals in different sports and activities; use in budgeting and monitoring expenses in relation to

income; calculate depreciation on equipment; monitor equipment uses.

- Administration--keep records on equipment, supplies, and other instructional materials including such information as when each was ordered and delivered, cost, and depreciation; maintain records about lockers, locks, combinations, and related information; keep records about towels and towel service; maintain budget and other fiscal information; maintain permanent physical education records of students; keep and analyze assessment information.
- Scheduling--maintain records about activities individuals have taken in selective programs; assist in placing students in selective programs so that each is more likely to attain his/her first choice (one of our students did such a program for the large university system which worked well and could easily be adapted and applied to a microcomputer such as the TRS-80); use in scheduling activities, teachers, and facilities.
- Individualizing instruction--obtain listings of possible long term goals, short term instructional objectives, activities to reach specified goals and objectives, and methods to consider as part of individualized education programs required under The Education for All Handicapped Children Act (P.L. 94-142) (readers should not infer that this process implies obtaining actual IEPs from the computer--true individualization cannot come from a computer; individualization requires knowledge, experience, and understanding of the teacher who takes information

that can be obtained from a computer and makes appropriate selections based on data about the individual student); monitor growth, development, and progress in reaching goals and objectives through the IEP or other processes for individualizing instruction.

- Developing knowledge, understanding, and appreciations of general physical education concepts, specific sport rules and strategies, and in skill development--emphasize whys and hows as well as whats in a variety of stimulating, challenging, and individual ways; develop programs based on desires, interests, and needs of specific classes and individual students; stimulate various sports and games that are difficult if not impossible to teach in traditional physical education settings; capitalize on existing commercially available software which can be used for a number of these purposes (i.e., Olympic Decathlon and Professional Football are examples of software packages available commercially which can be used in a variety of ways on the TRS-80 by students in physical education at different levels and for a variety of purposes) Apple, Atari, and other companies also have programs of this type which have many instructional and educational values and uses in physical education and sports.

With a printer even greater use and application of microcomputers can be attained. For example, report cards, records, and other information simply displayed without a printer can be generated with a

printer to add even more to efficiency, effectiveness, and efficacy of microcomputer use in physical education and sports.

The sky is the limit, in fact there is really no limit! Computers in general and microcomputers in particular have arrived--they are here to stay. We in physical education and coaching can and must use these electronic wizards to enhance our programs and the opportunities we provide students at any and all educational and instructional levels Students are becoming more conversant with and sophisticated in the mechanisms of computerization and data processing. If you haven't, it's high time you take the initial plunge--you'll find the water--keyboards, screens, and new language, that is--fine, and that it's not only exciting, challenging, and rewarding, but great <u>fun</u> as well.